

1. Record Nr.	UNINA9911019287003321
Autore	Ham Bryan M
Titolo	Analytical Chemistry : A Toolkit for Scientists and Laboratory Technicians
Pubbl/distr/stampa	Newark : , : John Wiley & Sons, Incorporated, , 2024 ©2024
ISBN	9781119894483 1119894484 9781119894476 1119894476 9781119894490 1119894492
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (689 pages)
Altri autori (Persone)	MaHamAihui
Disciplina	543
Soggetti	Analytical chemistry
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Cover -- Title Page -- Copyright -- Dedication -- Contents -- About the Authors -- Preface -- Acknowledgments -- About the Companion Website -- Chapter 1 Chemist and Technician in The Analytical Laboratory -- 1.1 Introduction-The Analytical Chemist and Technician -- 1.2 Today's Laboratory Chemist and Technician -- 1.2.1 Computers in the Laboratory -- 1.2.2 Laboratory Information Management Systems (LIMS) -- 1.3 ChemTech-The Chemist And Technician Toolkit Companion -- 1.3.1 Introduction to ChemTech -- 1.3.2 Opening ChemTech -- 1.3.3 Online ChemTech -- 1.4 Chapter Layout -- 1.4.1 Glassware, Chemicals, and Safety -- 1.4.2 Basic Math and Statistics -- 1.4.3 Graphing and Plotting -- 1.4.4 Making Laboratory Solutions -- 1.4.5 Titrimetric Analysis -- 1.4.6 Electrochemistry -- 1.4.7 Laboratory Information Management System (or Software) LIMS -- 1.4.8 Instrumental Analyses-Spectroscopy -- 1.4.9 Instrumental Analyses-Chromatography -- 1.4.10 Instrumental Analyses-Mass Spectrometry -- 1.4.11 Small Molecule and Macromolecule Analysis -- 1.5 USERS OF ChemTech -- Chapter 2 Introduction to the Analytical Laboratory --

2.1 Introduction to the Laboratory -- 2.1.1 The Scientific Method --
2.2 Laboratory Glassware -- 2.2.1 Volumetric Flasks -- 2.2.2 Beakers
and Erlenmeyer Flasks -- 2.2.3 Graduated Cylinders -- 2.2.4 Pipettes
-- 2.2.5 Evaporating Dishes -- 2.2.6 Flames and Furnaces in the
Laboratory -- 2.2.7 Laboratory Fume Hoods -- 2.2.8 Drying Ovens --
2.2.9 Balances -- 2.2.10 Refrigerators and Freezers -- 2.2.11 Test
Tubes -- 2.2.12 Soxhlet Extractions -- 2.2.13 Vacuum Pumps -- 2.3
Conclusion -- Chapter 3 Laboratory Safety -- 3.1 Introduction -- 3.2
Proper Personal Protection and Appropriate Attire -- 3.2.1 Proper Eye
Protection -- 3.2.2 Proper Laboratory Coats -- 3.3 Proper Shoes and
Pants -- 3.4 Laboratory Gloves -- 3.4.1 Natural Rubber (Latex) -- 3.4.2
Nitrile.
3.4.3 Neoprene -- 3.4.4 Butyl -- 3.4.5 Polyvinyl Chloride (PVC) --
3.4.6 Polyvinyl Alcohol (PVA) -- 3.4.7 Viton -- 3.4.8 Silver Shield/4H --
3.5 General Rules to Use Gloves -- 3.6 Safety Data Sheet (SDS) -- 3.7
Emergency Eyewash and Face Wash Stations -- 3.8 Emergency Safety
Showers -- 3.9 Fire Extinguishers -- 3.9.1 Types of Fires -- 3.10
Clothing Fire in The Laboratory -- 3.11 Spill Cleanup Kits -- 3.12
Chemicals and Solvents -- 3.13 First Aid Kits -- 3.14 Gases and
Cylinders -- 3.15 Sharps Containers and Broken Glass Boxes -- 3.16
Occupational Safety and Health Administration (OSHA) -- Chapter 4
Basic Mathematics in The Laboratory -- 4.1 Introduction to Basic Math
-- 4.2 Units and Metric System -- 4.2.1 Introduction to the Metric
System -- 4.2.2 Units of the Metric System -- 4.2.3 Converting the SI
Units -- 4.3 Significant Figures -- 4.3.1 Significant Figure Rules -- 4.4
Scientific Calculators -- 4.4.1 Example Calculator -- 4.4.2 Window's
Calculator -- 4.5 ChemTech Conversion Tool -- 4.5.1 Using the
Conversion Tool -- 4.5.2 Closing the Conversion Tool -- 4.6 Chapter
Key Concepts -- 4.7 Chapter Problems -- Chapter 5 Analytical Data
Treatment (Statistics) -- 5.1 Errors in the Laboratory -- 5.1.1
Systematic Errors -- 5.1.2 Random Errors -- 5.2 Expressing Absolute
and Relative Errors -- 5.3 Precision -- 5.3.1 Precision Versus Accuracy
-- 5.4 The Normal Distribution Curve -- 5.4.1 Central Tendency of
Data -- 5.5 Precision of Experimental Data -- 5.5.1 The Range -- 5.5.2
The Average Deviation -- 5.5.3 The Standard Deviation -- 5.6 Normal
Distribution Curve of a Sample -- 5.7 ChemTech Statistical Calculations
-- 5.7.1 Introduction to ChemTech Statistics -- 5.7.2 ChemTech
Chapter 5 -- Student's Distribution T Test For Confidence Limits --
5.8.1 Accuracy -- 5.8.2 The Student's t Test -- 5.8.3 Calculating the
Student's t Value -- 5.8.4 Probability Level.
5.8.5 Online ChemTech Program for Statistics -- 5.8.6 Sulfate
Concentration Confidence Limits -- 5.8.7 Sulfate t Distribution Curve
-- 5.8.8 Determining Types of Error -- 5.8.9 Determining Error in
Methodology -- 5.9 Tests of Significance -- 5.9.1 Difference in Means
-- 5.9.2 Null Hypothesis -- 5.10 Treatment of Data Outliers -- 5.10.1
The Q Test -- 5.10.2 The Tn Test -- 5.11 Chapter Key Concepts --
5.12 Chapter Problems -- Chapter 6 Plotting and Graphing -- 6.1
Introduction to Graphing -- 6.1.1 The Invention of the Graph -- 6.1.2
Importance of Graphing -- 6.2 Graph Construction -- 6.2.1 Axis and
Quadrants -- 6.3 Rectangular Cartesian Coordinate System -- 6.4
Curve Fitting -- 6.5 Redrawn Graph Example -- 6.6 Graphs of
Equations -- 6.6.1 Introduction -- 6.6.2 Copper Sulfate Data -- 6.6.3
Plotting the Data -- 6.6.4 Best Fit Line -- 6.6.5 PointSlope Equation of
a Line -- 6.6.6 Finding the Slope (m) -- 6.6.7 Finding the yIntercept
(b) -- 6.6.8 Solving for x -- 6.6.9 Estimating the Slope and Intercept --
6.6.10 Deriving the Equation from the Slope and Intercept -- 6.7 Least
Squares Method -- 6.7.1 Plotting Data with Scatter -- 6.7.2 Linear
Regression -- 6.7.3 Curve Fitting the Data -- 6.8 ComputerGenerated

Curves -- 6.8.1 Using ChemTech to Plot Data -- 6.8.2 Entering the Data -- 6.8.3 Plotting the Data -- 6.8.4 Linear Regression of the Data -- 6.8.5 Adding the BestFit Line -- 6.8.6 Entering a Large Set of Data -- 6.9 Calculating Concentrations -- 6.10 Nonlinear Curve Fitting -- 6.11 Chapter Key Concepts -- 6.12 Chapter Problems -- Chapter 7 Using Microsoft Excel® in the Laboratory -- 7.1 Introduction to Excel® -- 7.2 Opening Excel in ChemTech -- 7.3 The Excel Spreadsheet -- 7.3.1 Spreadsheet Menus and Quick Access Toolbars -- 7.4 Graphing in Excel -- 7.4.1 Making Column Headings -- 7.4.2 Entering Data into Columns -- 7.4.3 Saving the Spreadsheet. 7.4.4 Constructing the Graph -- 7.4.5 Inserting a Chart -- 7.4.6 The Chart Source Data -- 7.4.7 Chart Options -- 7.5 Complex Charting in Excel -- 7.5.1 Calcium Atomic Absorption (AAS) Data -- 7.5.2 Entering Ca Data into Spreadsheet -- 7.5.3 Average and Standard Deviation -- 7.5.4 Using the Formula Search Function -- 7.5.5 Inserting the Chart -- 7.5.6 Formatting the Chart -- 7.6 Statistical Analysis using Excel -- 7.6.1 Open and Save Excel StatExp.xlsx -- 7.6.2 Sulfate Data -- 7.6.3 Excel Confidence Function -- 7.6.4 Excel Student's t Test -- 7.6.5 Excel Tools Data Analysis -- Chapter 8 Making Laboratory Solutions -- 8.1 Introduction -- 8.2 Laboratory Reagent Fundamentals -- 8.3 The Periodic Table -- 8.3.1 Periodic Table Descriptive Windows -- 8.4 Calculating Formula Weights -- 8.5 Calculating The Mole -- 8.6 Molecular Weight Calculator -- 8.7 Expressing Concentration -- 8.7.1 Formal (F) Solutions -- 8.7.2 Molal (m) Solutions -- 8.7.3 Molar (M) Solutions -- 8.7.4 Normal (N) Solutions -- 8.8 The Parts PER (PP) Notation -- 8.9 ComputerBased Solution Calculations -- 8.9.1 ComputerBased Concentration Calculation-Molarity I -- 8.9.2 ComputerBased Concentration Calculation-Molarity II -- 8.9.3 ComputerBased Concentration Calculation-Normality I -- 8.9.4 ComputerBased Concentration Calculation-Normality II -- 8.10 Reactions in Solution -- 8.11 Chapter Key Concepts -- 8.12 Chapter Problems -- Chapter 9 Acid-Base Theory and Buffer Solutions -- 9.1 Introduction -- 9.2 Acids and Bases in Everyday Life -- 9.3 The Litmus Test -- 9.4 Early Acid-Base Descriptions -- 9.5 Bronsted-Lowry Definition -- 9.6 The Equilibrium Constant -- 9.7 The Acid Ionization Constant -- 9.8 Calculating the Hydrogen Ion Concentration -- 9.9 The Base Ionization Constant -- 9.9.1 OH Ion Concentration Example -- 9.9.2 Percent Ionization Example -- 9.10 Ion Product for Water. 9.11 The Solubility Product Constant (KSP) -- 9.11.1 Solubility of Silver (I) Thiocyanate -- 9.11.2 Solubility of Lithium Carbonate -- 9.12 The pH of a Solution -- 9.13 Measuring The pH -- 9.13.1 The Glass Electrode -- 9.14 Buffered Solutions-Description and Preparing -- 9.14.1 Le Chatelier's Principle -- 9.14.2 Titration Curve of a Buffer -- 9.14.3 Natural Buffer Solutions -- 9.14.4 Calculating Buffer pH -- 9.14.5 Buffer pH Calculation I -- 9.15 ChemTech Buffer Solution Calculator -- 9.16 Chapter Key Concepts -- 9.17 Chapter Problems -- 9.17.0 Ionization Reactions and Constants -- 9.17.0 Calculations with Ka and Kb -- 9.17.0 Solubility Product Ksp Calculations -- 9.17.0 Calculations Involving pH -- 9.17.0 Buffer Solution Calculations -- Chapter 10 Titration-A Volumetric Method of Analysis -- 10.1 Introduction -- 10.2 Reacting Ratios -- 10.3 The Equivalence Point -- 10.4 Useful Relationships for Calculations -- 10.5 Deriving the Titration Equation -- 10.5.1 Titration Calculation Example -- 10.6 Titrations in ChemTech -- 10.6.1 Acid/Base Titrations Using Molar Solutions -- 10.6.2 Titration Calculation Example -- 10.7 Acid/Base Titration Endpoint (Equivalence Point) -- 10.8 Acid/Base Titration Midpoint -- 10.9 Acid/Base Titration Indicators -- 10.9.1 The Ideal Indicator -- 10.10 Titrations Using Normal Solutions -- 10.10.1

Normal Solution Titration Example -- 10.11 Polyprotic Acid Titration -- 10.12 ChemTech Calculation of Normal Titrations -- 10.13 Performing a Titration -- 10.13.1 Titration Glassware -- 10.13.2 Titration Steps -- 10.14 Primary Standards -- 10.15 Standardization of Sodium Hydroxide -- 10.15.1 NaOH Titrant Standardization Example -- 10.16 Conductometric Titrations (Nonaqueous Solutions) -- 10.17 Precipitation Titration (MOHR Method for Halides) -- 10.17.1 Basic Steps in Titration -- 10.17.2 Important Considerations. 10.18 Complex Formation with Back Titration (Volhard Method for Anions).

Sommario/riassunto

This book serves as a comprehensive guide to analytical chemistry, providing a toolkit for scientists and laboratory technicians. It offers detailed insights into laboratory techniques, safety protocols, and the use of various analytical instruments. The text covers fundamental topics such as basic mathematics, data treatment, and graphing, as well as advanced subjects like spectrometry and titration methods. The authors aim to equip readers with the necessary skills and knowledge for effective laboratory work, making it an essential resource for professionals and students in the field of chemistry.
